Transportation Committee Workshop

Electricity Imports to California and Estimating the Generation Resource Mix

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Electricity Analysis Office

Presentation Overview

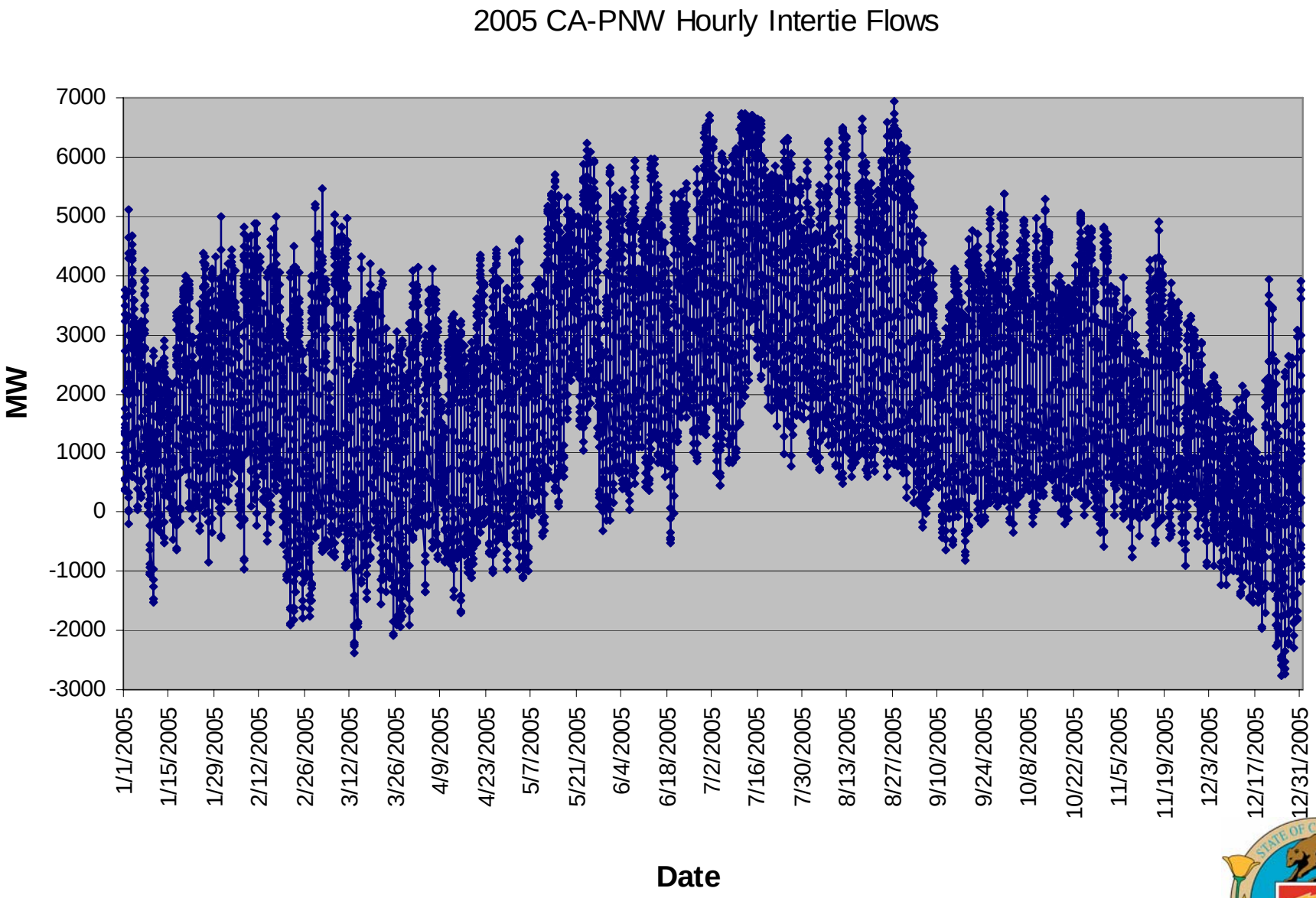
- What we know about electricity imports
- Role of electricity imports
- Methodologies to estimate resource mix

Resource Mix Analysis Studies

- Improve the methodology to estimate GHG emission associated with electricity imports
- Properly represent actual generation dispatch decisions
- Reflect the different types of electricity market transactions
- Consistent with other system studies

Data Availability to Track Imports

- Metered power flows between CA and out-of-state control operators
- Electricity generation and fuel use by power plant
- Power Source Disclosure for 70% of CA
- FERC Electronic Quarterly Reporting
- Limited information on the generation source of the electricity imports


2005 CA-PNW Hourly Intertie Flows
MW
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
-3000
1/1/2005
1/15/2005
1/29/2005
2/12/2005
2/26/2005
3/12/2005
3/26/2005
4/9/2005
4/23/2005
5/7/2005
5/21/2005
6/4/2005
6/18/2005
7/2/2005
7/16/2005
7/30/2005
8/13/2005
8/27/2005
9/10/2005
9/24/2005
10/8/2005
10/22/2005
11/5/2005
11/19/2005
12/3/2005
12/17/2005
12/31/2005
Date

Reported Imports and Exports

(Does not include Generation from Mohave or Intermountain)

Region	Year	Q1	Q2	Q3	Q4	Annual total
PNW	2001	2,686,806	2,925,793	3,164,629	3,895,215	12,672,443
	2002	4,902,982	9,340,960	8,894,501	5,068,055	28,206,498
	2003	4,900,088	7,717,723	6,382,322	4,774,696	23,774,829
	2004	4,231,046	6,284,849	5,599,096	6,247,893	22,362,884
	2005	4,592,016	6,062,609	7,593,342	4,098,955	22,346,922
SW	2001	11,498,217	12,842,356	8,382,562	10,225,639	42,948,774
	2002	10,690,112	9,130,572	9,271,389	12,704,560	41,796,634
	2003	11,892,989	9,597,592	10,832,254	11,739,573	44,062,408
	2004	12,434,004	11,294,721	12,424,582	12,586,469	48,739,776
	2005	11,822,051	9,443,747	11,644,778	12,883,050	45,793,626

Export (MWh)

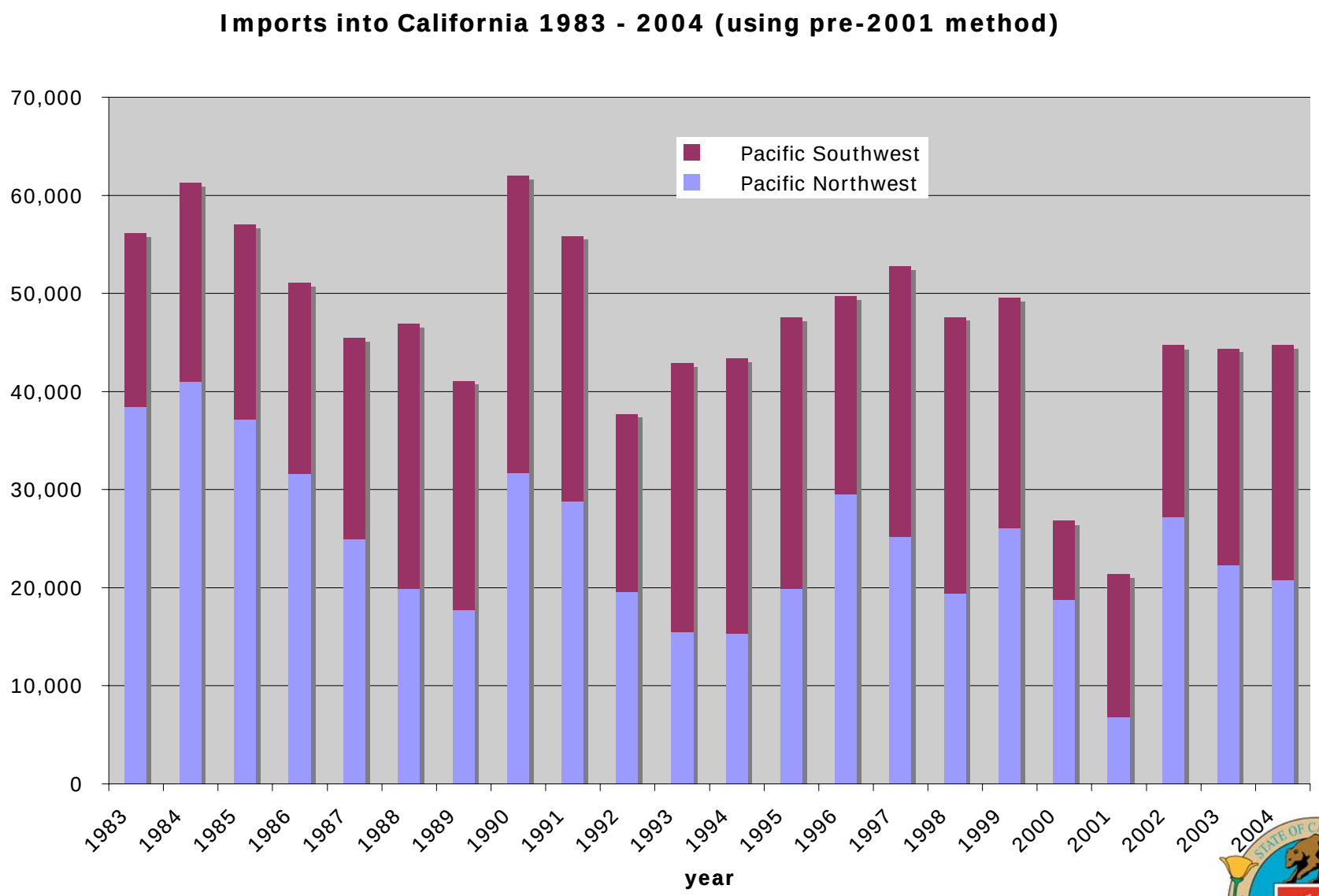
Region	Year	Q1	Q2	Q3	Q4	Annual total
PNW	2001	3,050,938	1,450,178	922,009	423,084	5,846,209
	2002	283,492	132,236	342,790	261,888	1,020,406
	2003	417,812	183,635	389,592	480,346	1,471,385
	2004	377,742	292,647	563,791	297,969	1,532,149
	2005	594,995	330,898	528,497	606,848	2,061,238
SW	2001	494,698	4,999,585	2,394,086	1,119,003	9,007,372
	2002	816,964	1,471,143	2,455,830	769,629	5,513,566
	2003	827,810	1,401,653	1,462,198	863,046	4,554,707
	2004	975,464	813,515	934,717	568,728	3,292,424
	2005	593,309	1,371,982	1,277,594	380,408	3,623,293

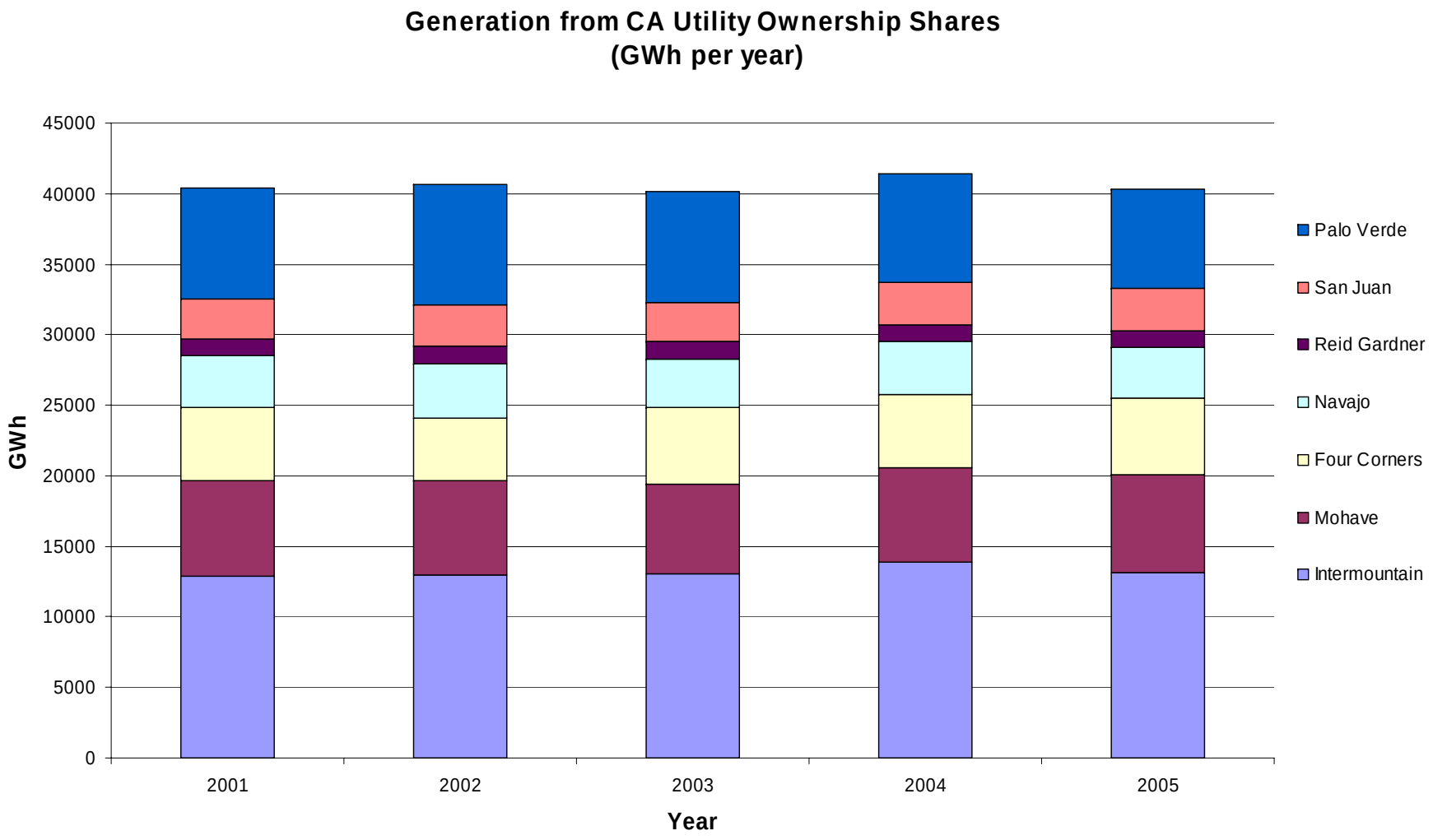
Net Import (MWh)

Region	Year	Q1	Q2	Q3	Q4	Annual total
PNW	2001	-364,132	1,475,615	2,242,620	3,472,131	6,826,234
	2002	4,619,490	9,208,724	8,551,711	4,806,167	27,186,092
	2003	4,482,276	7,534,088	5,992,730	4,294,350	22,303,444
	2004	3,853,304	5,992,202	5,035,305	5,949,924	20,830,735
	2005	3,997,021	5,731,711	7,064,845	3,492,107	20,285,684
SW	2001	11,003,519	7,842,771	5,988,476	9,106,636	33,941,402
	2002	9,873,148	7,659,429	6,815,560	11,934,931	36,283,067
	2003	11,065,179	8,195,939	9,370,056	10,876,527	39,507,701
	2004	11,458,540	10,481,206	11,489,865	12,017,741	45,447,352
	2005	11,228,742	8,071,765	10,367,184	12,502,642	42,170,333

Types of Electricity Imports

- Ownership shares of generation located out-of-state
- Contracts and other entitlements
- Purchases to satisfy customer obligations
- Purchases to cover unexpected short-term variations (i.e. forced outages)
- Economy Purchases
- Wheeling through CA


Imports into California 1983 - 2004 (using pre-2001 method)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Pacific Southwest
Pacific Northwest
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
year


Generation from CA Utility Ownership Shares
(GWh per year)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
GWh
2001
2002
2003
2004
2005
Year
Palo Verde
San Juan
Reid Gardner
Navajo
Four Corners
Mohave
Intermountain

Other Contract Deliveries

	2005 Output (GWh)	Out-of-State Shares	CA Imports (GWh)
Contracts for Hydroelectricity from SW – Western Area Power Administration			2,093
Boardman contracts (coal)		SDG&E & Turlock	900
Sempra ESP (coal)		29% of Load	1,714

2005 Firm and System Electricity Imports (GWh)

Imports Type	PNW	SW	Total
Firm Imports	1,123	44,159	45,282
System Imports	21,224	21,706	42,930
Total Imports	22,347	65,865	88,212

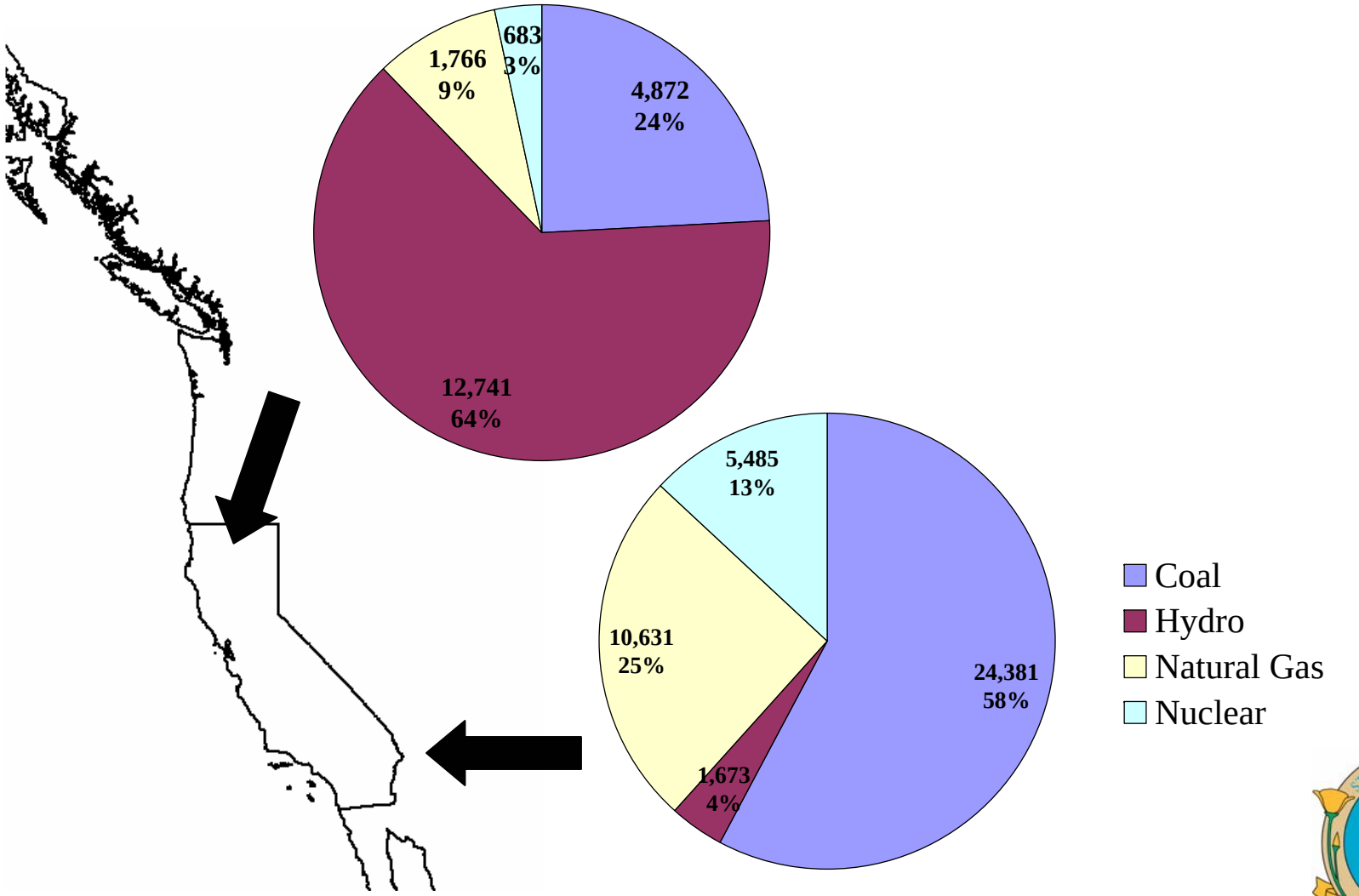
Resource Mix of System Imports

- Electricity is typically traded between many market participants
- The actual source is not tracked.
- System purchases are supplied by surplus electricity generation
- The surplus generation is estimated separately for the Pacific Northwest (PNW) and Desert Southwest (SW).

Existing Methodology Used for GHG Emissions Imports Inventory

- 1990 to 1999 import estimates based on 1994 Electricity Report findings
- 2000 to present GHG emission estimates apply the average generation mix in each region
- Net System Power Report assumes average generation mix for all imports

Net System Power Report
Imports from PNW and SW (GWh)



Limitations of Existing Approach

- Ignores daily dispatch decisions and system constraints
- Does not capture the types of electricity market transactions
- Likely overstates estimated electricity imports from out-of-state baseload generators
- Proposed methodology intended to resolve these problems

Proposed Methodology to Estimate Imports Resource Mix

- First identify ownership generation
- Identify long-term power purchase contracts and entitlements (i.e. Hoover)
- Remaining balance are considered system imports
- Require a system analysis to estimate associated generation serving these imports

Marginal Generation Resources Used for Electricity System Imports

- Utilities and generators typically use their cheapest electricity supplies to meet customer obligations
- Baseload generation is usually the lower cost resource, mostly owned by utilities
- Remaining surplus are generally the marginal generation resources
- Electricity from marginal generation will be sold if there is a market

Marginal Generation Study

- System simulations to identify marginal resources
- Gas-fired generation on the margin 96% of the time
- Coal-fired generation on the margin 4% of the time
- Marginal Generation results applied to the resource mix of the electricity system imports from the SW region
- PNW imports require a different consideration

System Imports from Pacific Northwest

- PNW system operates differently than the SW system
- PNW predominately a hydroelectric system
- High correlation between PNW water conditions and system imports
- Assume that 50% of system imports are from hydroelectric generation
- 46% from natural gas-fired generation
- 4 % from coal-fired facilities

Proposed Resource Mix for 2005 Electricity Imports

(GWH and Percent)

	PNW	Share	SW	Share	Total	Share
Total Imports	22,347		65,866		88,212	
Coal	1,758	7.9%	35,860	54.4%	37,617	42.6%
Hydro	10,723	48.0%	2,093	3.2%	12,816	14.5%
Natural Gas	9,866	44.1%	20,839	31.6%	30,705	34.8%
Nuclear	0	0.0%	7,074	10.7%	7,074	8.0%

Comparison of 2005 Statewide Resource Mix

Proposed and Net System Power Report Methodologies

Resource Type	Proposed Methodology	Net System Power Methodology
Coal	14.3%	20.1%
Large Hydro	16.3%	17.0%
Natural Gas	43.8%	37.7%
Nuclear	14.9%	14.5%
Renewables	10.7%	10.7%
Total	**100.0%**	**100.0%**

Conclusion

- Staff believes that the proposed methodology provides a better characterization than previous approaches
- More information is needed to refine the resource mix estimates and calculate associated GHG emissions
- Staff Paper on proposed methodology can be found at the Energy Commission website at: http://energy.ca.gov/2006publications/CEC-700-2006-007/CEC-700-2006-007.PDF
- Staff is considering a second workshop to present the latest staff studies on the subject